Golder Associates Ltd.

500 – 4260 Still Creek Drive
Burnaby, British Columbia, Canada V5C 6C6
Telephone (604) 296-4200
Fax (604) 298-5253

REPORT ON

STAGE 1 REMEDIAL ACTION PLAN
BRITANNIA MINE
BRITANNIA BEACH, BC

Submitted to:

Ministry of Water Land and Air Protection
Surrey, BC

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EXECUTIVE SUMMARY

The environmental issues pertaining to the Britannia Mine are well documented and the mine has been the subject of many technical studies since it's closure in 1974. The Provincial Remediator (Province) initiated a program of focused studies associated with remediation of the Site in August, 2001 with the appointment of a Project Manager (Golder) and, subsequently, Technical Consultants, to work on the Britannia Mine Remediation Project (BMRP). At the time of preparing this plan, the majority of the work programs undertaken by the Technical Consultants had been completed.

Studies pertaining to contaminated land aspects of the project were divided into the 'Fan Area' and the 'Additional Areas' and the findings are described in detail in the Technical Contractor (URS) Preliminary Site Investigation (PSI) and Detailed Site Investigation (DSI) reports (see References). These studies culminated in the preparation of 'remediation planning documents' for the Fan Area and the Additional Areas (the latter in draft status at the time of preparing this report). These documents were designed to allow for Regulator and Stakeholder consultation prior to preparing the Overall Remediation Plan (ORP). As part of the remedial option study in the fall of 2002, URS were requested to assess if any remedial measures could be implemented in the near-term, in particular within the Fan Area, that would have significant environmental benefit, be straightforward to undertake, and would not compromise longer-term remedial actions at the site.

Four surficial metal sources in the Fan Area were identified by URS as having the potential to contribute relatively high metal loading to Howe Sound and could be effectively dealt with through interim actions. These surficial metal sources located in the Fan Area were estimated by URS to represent approximately 40 percent of the potential metal loading sources to Howe Sound, excluding the mine and the ARD mine water discharge, and comprise:

- The "Concentrate Pile" located adjacent to the Mill building;
- The Sedimentation Pond (4150 Level); and
- Soils located on the slopes adjacent to and above the Mill building.

Also included in this list was the Settling Pond, located adjacent to the Fan Area copper launder structure. BMARC have subsequently excavated these materials, placed them into a temporary covered storage cell and installed a layer of low-permeable soil over the former pond area to minimize infiltration in this area.

These sources contribute to the metals loading to Howe Sound via groundwater and surface water pathways. The Stage 1 remedial actions proposed by the Province includes removal and/or management of the above sources, a surface water interceptor system and an interim groundwater capture system, combined with further modelling and engineering evaluation.

The proposed Stage 1 remedial actions are:

1. The concentrate pile will be excavated in its entirety to (or just below) existing site grades, and either:

    - removed from the Site as copper concentrate, and transported to the Myra Falls operation on Vancouver Island as supplementary feedstock to their concentrator; or

    - temporarily relocated to a secure, on-site temporary storage facility, located within the sedimentation pond at the 4150 level (see section 4.2.2), until permanent disposal locations have been further evaluated and commissioned (e.g. Jane Basin).

2. Sediments from the northern section of the sedimentation pond, nearest the outfall structure, will be excavated and a lock-block wall constructed across the pond (east-west), thus forming a containment cell with a concrete base. Sediments excavated from the northern portion of the pond will be deposited into this containment cell. This will also serve as a temporary containment cell for the in-situ sediments at the south end of the pond and for contaminated soils removed from other areas of the Site as part of the stage 1 remedial actions (e.g. the concentrate pile and/or from above and adjacent to the Mill Building). The soils stored within the containment cell will be graded, shaped, and tarped to promote clean water run off and minimize infiltration. Contaminated soils will remain in this temporary facility until re-located to a permanent location.

3. Loose copper ore soils will be excavated down to native bedrock in the area above the Mill Building (trestle area) and, as far as practicable, on the slopes adjacent to the Mill Building. This operation (and the slopes in particular) are anticipated to present significant Health and Safety challenges. As such, it is anticipated that the contractor will initially start work in the trestle area and then develop an operational plan for the slope areas.

4. Install and operate a pump in well EX1, located in the concentrate wharf, and discharge the recovered groundwater to the existing deep outfall, this action will move the discharge zone for the intercepted groundwater away from the environmentally sensitive intertidal zone to below the photic zone, thus providing an interim and potentially significant environmental benefit. Additionally, the need for long-term groundwater capture and treatment can be further assessed by this pumping program. It is anticipated that this pumping well will continue to operate until long-term remedial measures for the Fan Area have been developed and implemented.

5. Undertaking an engineering evaluation of how best to install a surface water interceptor system around the Fan Area margin, and in particular along the southern margin, through the BC Museum of Mining (BCMOM) property. It is anticipated that this system could include local surface re-grading to promote more effective run off to reduce infiltration and diversion of run off away from the existing storm drain system. Once this evaluation is completed, if feasible, the system will be designed and implemented.

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1.0 INTRODUCTION

This document presents the Stage 1 (Interim) Remedial Action Plan (RAP) for the Britannia Mine site, on behalf of the Province of BC, represented by the Ministry of Water, Land and Air Protection (MWLAP).

1.1 Report Objective and Format

Since September 2001, the Province has been undertaking a series of studies that were crucial to developing the Overall Remediation Plan (ORP). Those studies are referenced in Section 1.2.

The objective of this Stage 1 RAP is to present a number of remedial actions that will provide immediate benefit to the environment and that are compatible with the Overall Remediation Plan (ORP) for the Britannia Mine Site being prepared by the Province. The remedial actions presented in this report are a sub-set of the actions to be included in the ORP and focus on the Britannia Creek Fan area.

The format of this Stage 1 RAP is provided below:

- background information (Section 1.2);
- summary of environmental issues and remedial objectives for this site (Section 2);
- the regulatory framework particular to this Site (Section 3);
- proposed Stage 1 remedial actions and schedule (Section 4);
- implementation of the Stage 1 remedial actions, including soil and groundwater management, health and safety, public consultation, permitting, sampling, etc. (Section 5); and
- inspection and monitoring plan (Section 6).

1.2 Background

The environmental issues pertaining to the Britannia Mine are well documented and the mine has been the subject of many technical studies since it's closure in 1974. In April 2001, the government of the Province of BC reached a financial settlement with former mine owners/operators that enabled a program of focused study to define the environmental issues and allow appropriate remedial measures to be developed and implemented. These studies commenced in August 2001 with the appointment of a Project Manager (Golder) and, subsequently, Technical Consultants, to work on the Britannia Mine Remediation Project (BMRP). At the time of preparing this plan, the majority of the work programs undertaken by the Technical Consultants had been

completed, with finalization of a number of reports remaining, along with ongoing monitoring and maintenance activities.

Pertinent studies and reports completed for the Province that relate to the Stage 1 RAP are included in the References section of this document.

One of the first tasks of the Technical Consultants was to consider the possibility and benefits of implementing interim remedial actions such that potential harmful effects from existing and presently discharging contaminants could be reduced during the period required to develop and implement more complete and final remedial solutions. Interim treatment of the acid rock drainage (ARD) flowing from the 4100 Level was evaluated, as were possible interim remedial measures for contaminated land, groundwater and surface water issues associated with historical mineral processing, transport and storage areas located on the mine site. Options for interim treatment of ARD discharge were reviewed by CH2M Hill and it was concluded (Technical Memorandum dated December 14, 2001; Appendix 1) that interim remedies for the ARD were not feasible. Interim measures for the contaminated land and water areas, such as the Fan Area, were also reviewed with the resultant decision to defer interim actions until the completion of the detailed site investigations such that priorities and potential benefits of possible interim actions could be identified.

The investigations of potentially contaminated land, groundwater, and surface water associated with the mine are now complete. These studies were divided into the 'Fan Area' and the 'Additional Areas' and the findings are described in detail in the Technical Contractor (URS) Preliminary Site Investigation (PSI) and Detailed Site Investigation (DSI) reports (see References). These studies culminated in the preparation of 'remediation planning documents' for the Fan Area and the Additional Areas (the latter in draft status at the time of preparing this report), and were designed to allow for Regulator and Stakeholder consultation prior to preparing the Overall Remediation Plan (ORP). As part of the remedial option study in the fall of 2002, URS were requested to assess if any remedial measures could be implemented in the near-term, in particular in the Fan Area, that would have significant environmental benefit, would be straightforward to undertake and would not compromise longer-term remedial actions at the site.

A list of potential interim remedial actions for the Fan Area were presented in a Technical Memorandum prepared by URS, dated October 31, 2002 (Appendix 2). A summary is provided below:

1. *Concentrate Pile:*

   - *Description: Located near Mill Building, and contains approximately 2,700 m^3 of concentrate removed from Mill Building. This material contains high concentrations of soluble metals*
   - *Issue: Runoff from pile, potentially acquiring high concentrations of dissolved metals, flows directly into a storm drain and is discharged through this storm drain into Howe Sound*
   - *Possible interim action: Contain wastes in-situ with a low lock-block wall constructed around pile, and tarp to block precipitation infiltration*
   - *Potential benefit: Immediately reduces a contaminant load to surface run off and groundwater discharging into Howe Sound*

2. *Settling Pond:*

   - *Description: Located next to the 4100 copper launder and contains approximately 450 m^3 of sludges with high concentrations of soluble metals*
   - *Issue: Runoff from the pond and infiltration through the sludges, potentially acquiring high concentrations of dissolved metals, flows into the fan area groundwater system discharging into Howe Sound*
   - *Potential interim action: Scrape up sludges (and possibly some of the underlying soils), consolidate into a single pile, surround with a low wall, and tarp to block precipitation infiltration, or removal to a temporary ex-situ, on-site storage location*
   - *Potential benefit: Immediately reduces a contaminant load to waters discharging into Howe Sound*

3. *Sedimentation Pond:*

   - *Description: Located adjacent to the 4150 portal and the sedimentation pond, contains approximately 1,125 m^3 of sludges, low grade ore and waste rock. Due to dilapidation and design, the pond only partly contains these sludges, ore and rock*
   - *Issue: Runoff from the pond, potentially containing high concentrations of dissolved metals, flows out of the fractured end of the pond, discharges into the Fan Area (surface and/or groundwater systems), and from there, discharges into Howe Sound*
   - *Potential interim action: Construct and place waste in a lock-block facility at the south end of the pond, consolidate sludges into this facility and minimize infiltration by contouring and placing a tarp over the pile*

- *Potential benefit: Immediately reduces a contaminant load to waters discharging into Howe Sound*

4. *Mill Slopes (4100 Trestle):*

   - *Description: Located on either side of Mill Building and above 4100 trestle*
   - *Issue: Contains approximately 3,000 m^3 of low grade ore and waste rock (in trestle area and to the east of the Mill Building). Seepage flows through these mine wastes, potentially acquiring high concentrations of dissolved metals, is collected into storm drains, and discharged through these into Howe Sound*
   - *Possible interim action: Excavate materials and transport by truck either to the (temporary) Sedimentation Pond storage location or to a separate containment area constructed on the 4100 level*
   - *Potential benefit: Immediately reduces a contaminant load to waters discharging to Howe Sound*

5. *Permanent diversion ditch system:*

   - *Description: Comprising two ditches: one ditch would be installed at or near the 4100 level and divert surface runoff to Britannia Creek; the other ditch would be installed at the base of the slope surrounding the Fan Area and divert surface runoff to Howe Sound*
   - *Issue: Surface water runoff currently flows over mine wastes in the Fan Area, potentially loaded with metals, and then discharges into Howe Sound*
   - *Potential interim action: Install two ditches to intercept surface runoff prior to contact with mine wastes in the Fan Area, and divert intercepted water directed to Britannia Creek or Howe Sound*
   - *Potential benefit: Preliminary water balance calculations by URS indicates that an estimated 490,000 m^3 (58% of total water entering Fan Area annually) of surface runoff flows annually into the Fan Area from the surrounding catchment area. A 50% capture efficiency by the 4100 level ditch could reduce annual water inflows to the Fan by approximately one quarter, resulting in a reduction of potentially contaminated water to Howe Sound. The second ditch, proposed for installation at the toe of the slope bounding the Fan Area, would further enhance reduction of water flowing through mine waste, particularly in the vicinity of the Mill building and the 4100 level waste dump – areas of high potential metal loading*

The above proposed actions were evaluated by the Province and discussed on-site with Britannia Mines and Reclamation Corporation (BMARC) and with the BC Museum of Mining (BCMOM) in November 2002. Golder Associates and a specialist environmental remediation contractor (HAZCO) were also in attendance during these discussions.

The remediation contractor subsequently provided a proposal for undertaking components of the proposed actions. The remediation contractor also identified potential problems with elements of implementation. In particular, installing drainage ditches along the south and east margins of the Fan Area and along the 4100 level were identified as being problematic, as would working on the slopes adjacent to the Mill Building. Issues associated with surface drainage included siting of the water treatment plant (Site 'A' at the 4100/4150 Level, as per the Feasibility Study), which would impact the ditch during site preparation and construction. Access/installation logistics through the BCMOM property and through the wooded area along the base of the eastern margin slope (BMARC property) also needed clarification prior to realistic pricing, and the fate of the collected water, potentially with elevated metal concentrations, required resolution prior to implementation of a surface water interceptor system.

The proposals resulting from this review were then discussed at the Province's Technical Advisory Committee (TAC) meetings in December 2002 and January 2003, concluding with an agreement to proceed in principal with interim actions.

BMARC reported in a letter, dated January 2, 2003 (Appendix 4) that they had begun remediation of the copper launder settling pond (item 2 above) as part of their proposed program of remedial actions. BMARC have since completed excavation of the metals contaminated soils from the pond area and placed them in an adjacent concrete bunker. The soils have been tarped to inhibit rainfall infiltration. In addition, BMARC report that a layer of clay soil has been placed over the former area of the settling pond to minimize ongoing infiltration through this area.

The remaining proposed Stage 1 remedial actions were presented for comment to the Regulator and Stakeholders (BMARC and BCMOM) on February 17, 2003. These comments and subsequent regulatory and stakeholder comments, provided in a letter, dated March 10, 2003, and in a meeting held on March 27, 2003, have been taken into consideration in preparing this document, and in particular, concerns expressed by the Regulator with regard to groundwater capture and the need to minimize contaminant flux to Howe Sound by the groundwater transport pathway.

The proposed Stage 1 remedial actions are presented in Section 4 below.

2.0 SUMMARY OF THE ENVIRONMENTAL ISSUES

The environmental issues pertaining to the Britannia Mine Site are well documented elsewhere (see References) and are not presented here in detail. However, a brief summary of each of the issues are provided in the following sections as background and as support for the proposed Stage 1 remedial actions.

2.1 Acid Rock Drainage

The primary source of pollution emanating from the mine site is acid rock drainage (ARD), containing high levels of heavy metals, in particularly copper and zinc. Work associated with understanding the source, storage and transport of the ARD has been the subject of a number of studies, the most recent being the work undertaken by SRK associated with the BMRP. The SRK work included a combination of geotechnical, hydrological and hydrogeological studies. ARD discharge from the mine is currently to Howe Sound via a 'deep outfall' (depth 26 metres below sea level) to avoid direct discharge to the surface, more biologically active levels (photic zone). The mine discharges in the order of 5 million cubic metres of ARD annually, with a pH of approximately 3 and copper concentrations in the 20 to 40 mg/L range, resulting in average daily loadings to Howe Sound of approximately 290kg/d each of copper and zinc.

2.2 Soil and Groundwater

Sources of metal loading to Howe Sound are present throughout the Fan Area, though are concentrated in the southern half of the Fan, where mineral processing, handling and storage took place historically. These sources comprise ore, waste rock, tailings, mill concentrates and sludges (URS, AEC1). Site investigations and historical review identified numerous surficial and subsurface sources. The investigations also identified that groundwater and stormwater run-off were the predominant transport pathways for metal contamination from the Fan Area to Howe Sound. Figures 2 and 3 show the location of the metal sources identified in the URS studies. Estimates of metal loading to Howe Sound from these sources have been calculated in the DSI to total approximately 10 kg/day of copper and 16 kg/day of zinc for the Fan Area, the majority from the south Fan Area.

Areas outside of the Britannia Creek alluvial Fan, termed the Additional Areas, also contain sources of metals loading to Howe Sound, with Britannia Creek and Furry Creek representing the major transport pathways for these contaminants. A remediation planning document has been prepared pertaining to these areas (currently in draft). Contaminant loadings from these sources are considerably lower than for the Fan Area

and have not been identified as candidates for Stage 1 remedial actions, however, these will be addressed in the ORP.

2.3 Off-Shore Sediments

Howe Sound off-shore of the Site is known to have been infilled by tailings disposal during the life of the mine. Environment Canada have been undertaking a series of studies aimed at determining the nature and severity of these deposits and potential effects on the environment. Environment Canada is expected to report their findings in the near future. The offshore sediments are not within the scope of the BMRP and no remedial actions are planned in this regard either in the interim or in the ORP.

3.0 REGULATORY FRAMEWORK

The key federal and provincial acts, regulations and guidelines applicable to the Britannia Mine site are presented in the Overall Remediation Plan (in preparation at the time of submitting this report), of which this Stage 1 Remediation Plan is an integral, albeit leading part.

As a general summary, risk-based standards form the foundation of the overall remedial approach being applied to the Site. Remediation under this approach therefore comprises a combination of contaminant source removal or isolation, transport reduction or control, and receptor tolerance or effect evaluation. 'Interim' actions, under this approach, are usually 'stop-gap' actions designed to more immediately mitigate or alleviate existing or soon to be existing effects or potential effects on human health or the environment, during which time more permanent and certain remedial measures can be identified, evaluated, and implemented. The actions proposed in this document may be considered as 'interim' or as the first stage in implementing the ORP.

4.0 STAGE 1 REMEDIAL ACTIONS

Under risk-based remediation, it is often possible to significantly reduce risk by identifying and remediating specific contaminant sources or transport pathways which disproportionately represent a major or higher portion of the aquatic or human health risk at the site as a whole. If these sources can be identified, and either temporarily isolated and contained, reduced, removed to more secure locations, or permanently removed early in the remediation program, benefits can also be disproportionately high.

4.1 Mine Water (ARD) Discharge

The mine workings and the ARD mine water discharge have been identified as the major source of contamination and potential contamination at Britannia. As discussed in Section 1.2, one of the first major issues therefore to be addressed by the Technical Consultants was the possibility of implementing interim remedial actions associated with treating the ARD flowing from the 4100 level. Given the magnitude of this mine discharge, and its overall proportion when compared to all other potential contaminant discharges from the Site, interim actions that provide only a relatively small reduction in contribution from this source could potentially result in a significant lowering of risk to aquatic life. Options for interim treatment were therefore reviewed by the Technical Consultant (CH2M Hill) associated with this aspect of the BMRP; however, it was concluded that interim remedies for the ARD were not feasible (Appendix I).

The current Stage 1 RAP does not include any measures for interim treatment of the ARD discharge from the mine.

4.2 Source Containment or Removal: Soils

Recognizing that interim source or transport control of the largest contaminant site risk, that being ARD mine water discharge, is not feasible, there are other smaller, but still important sources for which interim remediation is possible. These actions should, if implemented, are expected to result in some measurable degree of risk reduction.

Four surficial metal sources in the Fan Area have been identified by the Technical Consultant (URS) as having the potential to contribute relatively high metal loading to Howe Sound and which could be effectively dealt with through interim actions (see Section 1.2). The term, 'relatively high', is used here comparatively to all other potential and identified sources, but excludes the mine workings and the ARD mine water discharge (the mine water discharge arguably represents over 95 percent of the metal loading to Howe Sound from the mine complex). These surficial metal sources located in the Fan Area, estimated by URS to represent approximately 40 percent of the potential

metal loading sources from the Fan Area to Howe Sound, excluding the mine and the ARD mine water discharge, comprise:

- The "Concentrate Pile" located adjacent to the Mill building;
- The Lower Sedimentation Pond (launder sediment);
- The Sedimentation Pond (4150 Level); and
- Soils located on the slopes adjacent to and above the Mill building.

BMARC has completed excavation of the metals contaminated soils from the lower sedimentation pond area and placed them in an adjacent concrete bunker (temporary management by storage). The soils have been tarped to minimize rainfall infiltration and, reportedly, a layer of clay soil has been placed over the former pond area to minimize infiltration in this area.

Each of the proposed Stage 1 remedial actions to be undertaken by the Province are described in detail below:

4.2.1 Concentrate Pile

The concentrate pile, comprising approximately 2,700 m^3 of material, will be excavated in its entirety to (or just below) existing site grades, and either:

- **removed from the Site as copper concentrate, and transported to the Boliden Myra Falls operation as supplementary feedstock to their concentrator; or**
- **temporarily relocated to a secure, on-site temporary storage facility, located within the sedimentation pond at the 4150 level (see Section 4.2.2), until permanent disposal locations have been further evaluated and commissioned (e.g. Jane Basin).**

At the time of preparing this report, a request for proposal (RFP) is being prepared for the transport of this material to Myra Falls. A soils management plan (example in Appendix III) and Health and Safety Plan will be prepared prior to implementing this action.

A schedule for this work is presented in Section 5.3.

4.2.2 Sedimentation Pond at 4150 Level

Stage 1 remedial works associated with the sedimentation pond will comprise removing the sediments from the northern section of the pond nearest the outfall structure, building a lock-block barrier across the pond (east-west), thus forming a containment cell with a concrete base, and depositing the sediments excavated from the northern end of the pond into this containment cell. The southern end of the pond will also provide a temporary containment cell for the in-situ sediments at this end of the pond and for contaminated soils removed from other areas of the Site as part of the Stage 1 remedial actions (e.g. from above and adjacent to the Mill Building). The soils stored within the containment cell will be graded, shaped, and tarped to promote clean water run off and minimize infiltration. Contaminated soils will remain in this temporary facility until re-located to a permanent location.

A schedule for this work is presented in Section 5.3.

4.2.3 Soils Located Above and Adjacent to the Mill Building

Loose copper ore soils will be excavated down to native bedrock in the area above the Mill Building (trestle area) and, as far as practicable, on the slopes adjacent to the Mill Building. This operation (and the slopes in particular) are anticipated to present significant Health and Safety challenges. As such, it is anticipated that the contractor will initially start work in the trestle area and then develop an operational plan for the slope areas.

Materials removed from these areas will be relocated to a secure, on-site temporary storage facility, located within the sedimentation pond at the 4150 level (see Section 4.2.2), until permanent disposal locations have been further evaluated and commissioned.

A schedule for this work is presented in Section 5.3.

4.3 Contaminant Transport Reduction or Containment: Groundwater

Again recognizing that interim source or transport control of the largest contaminant site risk, that being ARD mine water discharge, is not feasible, there are other smaller but still important transport sources for which interim remediation is possible. The contaminant transport associated with groundwater flowing through and discharging from the Fan Area is one such transport pathway for which application of interim measures are potentially feasible.

Results from investigations and studies conducted by the Technical Consultant (URS) indicate that the groundwater contaminant flux from the Fan Area to Howe Sound was in the order of 10 Kg/day of copper and 16 Kg/day of zinc, with the south Fan Area contributing the bulk of these amounts. These same studies indicate that pumping groundwater from well EX1, installed in the south Fan Area (concentrate wharf) as part of the DSI groundwater investigations, could potentially intercept 50% of the groundwater flux in the south Fan Area.

It is therefore proposed to install and operate a pump in well EX1 as part of the Stage 1 remedial actions and discharge the recovered groundwater to the existing deep outfall This action would move the discharge zone for the intercepted groundwater away from the environmentally sensitive intertidal zone to below the photic zone, thus providing an interim and potentially significant environmental benefit. Additionally, the need for long-term groundwater capture and treatment can be further assessed by this pumping program. In particular, it can provide a mechanism by which to assess whether other interim and long-term remediation measures implemented in the Fan Area improve groundwater discharge quality. It is anticipated that this pumping well will continue to operate until long-term remedial measures for the Fan Area have been developed and implemented.

Operation of this pumping well as indicated above, will also provide additional technical information required to further evaluate the feasibility and effectiveness of a long-term groundwater capture system for the Fan Area. The anticipated additional groundwater investigation program for the south Fan Area, considered a part of this remedial action, will comprise:

a) Long-term pumping from pumping well EX1:

- Initially step pumping tests to determine:

  - pumping well characteristics and well efficiency;
  - pumping rate at which seawater enters the well (upwelling of saline/freshwater interface); and
  - select an optimized pumping rate for maximum capture efficiency.

- Long-term pumping at optimized rate to assess:

  - aquifer characteristics and parameters;
  - long-term chemistry of pumped water; and
  - well 'aging' characteristics (potential fouling of screen/pump) and identify likely long-term maintenance requirements/issues.

b) Installation of additional pumping well(s) and/or observation wells, if required, to prove concept/provide additional hydraulic/geochemical data;

c) Seismic, electrical resistivity and/or electromagnetic geophysical surveys to define bedrock geometry and determine location of saline/freshwater interface;

d) Refine the groundwater model: to be used in optimizing a groundwater capture system; and

e) Develop groundwater capture concept and engineering designs/costs.

Appendix 5 includes a (Golder) Technical Memorandum that provides additional information on the investigation and assessment program associated with the groundwater capture system. These investigations are necessary because the potential for seawater intrusion at high capture efficiencies requires detailed knowledge of the hydrogeologic regime and variable density effects (seawater). These data will be used to develop a sufficiently accurate model that will simulate seawater intrusion, and will be used to assess and design an efficient groundwater capture system, if required. In addition, the model would also be used, together with monitoring data, to assess the performance of the system.

The groundwater pumping and discharge will require a permit similar to that issued by the Regulator in early 2002 for test pumping purposes, though for a significantly longer term. Assuming that this can be arranged expeditiously, the system could be operational by May 2003.

A schedule for this work is presented in Section 5.3.

4.4 Contaminant Transport Reduction or Containment - Surface Water Interceptor Systems

Surface drainage collected and discharging from the Fan Area has been identified as another potentially significant contaminant transport pathway, for which application of interim measures are potentially feasible and immediate potential environmental benefit could be achieved. However, the installation of surface water interceptors at the 4100 level and around the Fan Area margin pose some technical challenges as discussed in Section 1.2. An evaluation of these technical issues indicates that only the system proposed for the Fan Area margin is feasible as a Stage 1 action, and that the 4100 level interceptor engineering design and installation should be deferred to the civil design work associated with the construction of the water treatment plant at the 4100/4150 level (Site 'A' in the Feasibility Study). The approximate location of a Fan Area margin

interceptor system is shown in Figure 3. The interceptor system may comprise a combination of interconnected engineered, lined trenches, possibly gravel filled with various civil components (sumps, pumps and piping).

The proposed Stage 1 remedial action therefore comprises undertaking an engineering evaluation of how best to install a surface water interceptor system around the Fan Area margin, and in particular along the southern margin, through the BCMOM property. It is anticipated that this system could include local surface re-grading to promote more effective run off to reduce infiltration and diversion of run off away from the existing storm drain system. Once this evaluation is completed, if feasible, the system will be designed and implemented.

Surface water captured by the interceptor system would likely have elevated metals content and it is therefore anticipated that as part of the Stage 1 RAP a catch pit(s) and pumping system(s) may be required, with the pumped water being fed to the existing deep outfall. In the longer-term, it is anticipated that this water (or portion thereof) could be fed to the treatment plant if such treatment is shown to be necessary.

The anticipated work program associated with installing the interceptor system around the Fan Area margin includes:

- Site walkover inspection by a civil engineer – identifying 'on the ground' issues;
- Site survey – provide grade information for engineering;
- Assessment of catchment area and run-off volumes;
- Evaluation of discharge options for the ditches – possibly a sump/pump for the southern ditch (to deep outfall), discharge to deep outfall manhole for the north ditch (depends on grades and volumes);
- Detailed engineering design; and
- Implementation.

At the time of preparing this document, the site inspection by a (Golder) engineer had been undertaken as the first step in the above program and a detailed schedule of implementation and associated cost estimates is in preparation. A preliminary schedule for this work is presented in Section 5.3.

5.0 IMPLEMENTATION OF STAGE 1 REMEDIAL ACTIONS

5.1 Consultation Process

The remedial actions described in this document were presented at a technical meeting with the Regulator and Stakeholders (landowners) held on March 27, 2003. Detailed consultation with the landowners will be on going prior to and during implementation.

5.2 Remediation Methods

Section 4 describes the proposed remediation methods to be implemented at the Site as Stage 1 actions of the ORP. Monitoring of the works will include, where appropriate, soil and groundwater sampling and classification. A soil management plan will be developed prior to implementation (an example is included as Appendix III)

5.3 Schedule

A schedule for the implementation of the Stage 1 remedial actions is presented in Figure 4. In summary, assuming approval of the plan by the Regulator in early April 2003, the remedial actions can be implemented by May 2003.

5.4 Stage 1 RAP Summary

A summary of the Stage 1 remedial actions is presented in Table 1 below:

Item	Task Description	Anticipated Start Date
Concentrate Pile	Remove material from Museum property and transport to an off-site processing facility or place in a temporary storage facility at 4150 Level.	May 2003
Sedimentation Pond (at 4150 Level)	Excavate sludge and place in a temporary storage facility in the south portion of the pond.	May 2003
Mill Slopes	Remove materials adjacent to the former mill building, and place in a temporary storage facility at 4150 Level.	June 2003
Groundwater Control	Install a pump at well EX-1 and piping to the deep outfall connection. Conduct a pumping test to obtain further hydrogeological data. Continue to operate recovery well to control groundwater migration to Howe Sound.	June 2003
Surface Water Control	Engineering assessment of constructing an interception system along the base of the slope bordering the fan area. If feasible, implement the interceptor system.	April 2003

6.0 INSPECTION AND MONITORING PLAN

6.1 Monitoring of Groundwater Quality

The groundwater monitoring program for the Site will be determined as part of the Overall Remediation Plan (ORP), however, it is proposed that a round of groundwater samples be taken and analyzed from monitoring wells downstream of the proposed Stage 1 remedial actions before commencement of the works and one month after completion of the works to assess if any changes to the groundwater chemistry occur as a result. Monitoring arrangements associated with the proposed groundwater pumping program will be determined as part of the detailed design of the program.

The monitoring program, described in detail in the ORP, is a critical component for implementing remedial measures, especially where the remedial approach is risk based. Monitoring results provide the basis for evaluating whether interim actions are successful, and whether they need to be incorporated within the longer-term remediation program. Some interim actions may become redundant as other remedial actions remove or contain contaminant sources, or reduce or contain contaminant transport pathways. Additionally, development of risk-based standards for the inter-tidal, as example, will assist in directing need for specific ongoing remedial actions.

6.2 Reporting

Workplans for each of the Stage 1 remedial actions outlined in this document will be prepared and submitted to the Regulator and Stakeholders prior to each component of the proposed work commencing. These workplans will include appropriate health and safety plans, soil and groundwater management plans and schedules.

The results of all site remediation activities including inspections, groundwater capture system performance, and monitoring at the Site will be summarized in the bi-weekly progress reports submitted to the Regulator. In addition, a Monitoring and Maintenance Report, will be issued three months following implementation. The report will include the results of chemical testing conducted during the previous quarter and an interpretation of the data collected. The report will also provide recommendations, if any, for revisions to the monitoring and maintenance schedules, test programs, and the need to invoke contingency actions, if warranted, to ensure that the remedial plan objectives, as presented in the Overall Remediation Plan, are met.

7.0 LIMITATIONS AND USE OF REPORT

This report was prepared for the exclusive use of BC MWLAP. The report is based on data and information collected during previous investigations conducted by technical consultants and is based solely on the reported findings. The data presented in previous reports represent soil and groundwater conditions encountered at the sampling locations tested during that time period. Soil and groundwater conditions may vary with location, depth, time, sampling methodology, analytical techniques and other factors. Golder Associates Ltd. makes no warranty, expressed or implied, and assumes no liability with respect to the use of the information contained in this report at the subject site, or any other site, for other than its intended purpose.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Golder Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

If new information is discovered in the future, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this report and provide amendments as required prior to any reliance upon the information presented herein.

For the Provincial Remediation Team

Brian D. Clarke
Director
Special Remediation Projects, MWLAP

Gerry O'Hara, M.Phil. P.Eng.
Principal, Golder Associates
Project Manager, Britannia Mine Remediation Project

Attachments
GOH/rp/jnp
012-1830

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8.0 REFERENCES

Britannia Mines and Reclamation Corp. 2003a. Letter to BCMWLAP and BCMEM re: Britannia Mine Reclamation Progress Report, dated January 2, 2003.

Golder Associates Ltd. 2001a. *Britannia Creek Fan Preliminary Site Investigation, Britannia Beach, BC*, dated April 5, 2001.

Golder Associates Ltd. 2002a. Letter to BCMWLAP re: Britannia Remediation Project – Interim Water Treatment, dated January 10, 2002. (Attachment: CH2M Hill Memorandum dated December 14, 2001).

Hazco Environmental Services Ltd. 2002a. Letter to Golder Associates re: Britannia Mine Site Proposal, dated December 5, 2002.

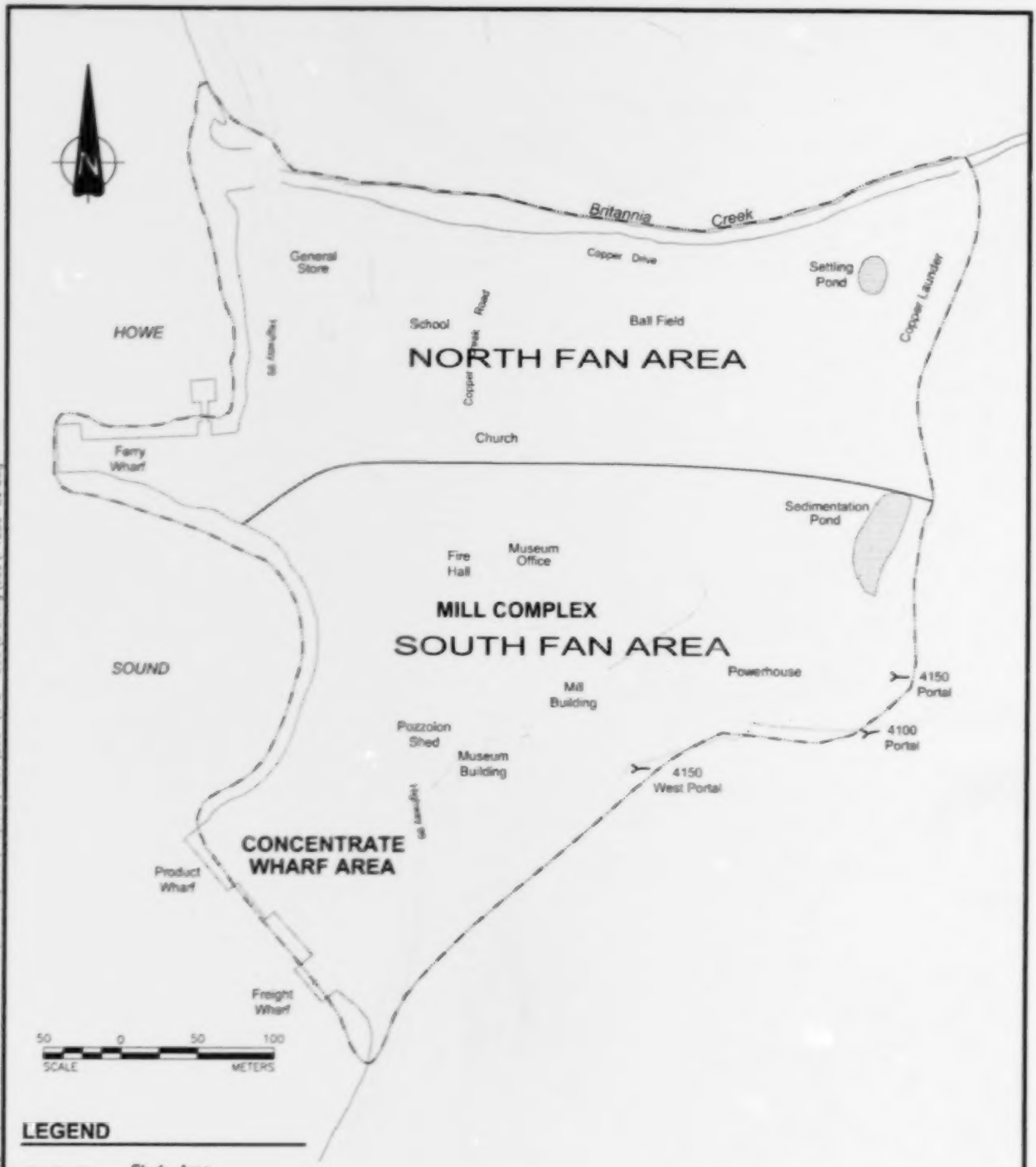
URS Corporation. 2002a. *Britannia Contaminated Sites Investigation, Stage 1 Preliminary Site Investigation*, dated January 29, 2002.

URS Corporation. 2002b. *Britannia Contaminated Sites Investigation, Fan Area Detailed Site Investigation*, dated June 7, 2002.

URS Corporation. 2002c. *Britannia Contaminated Sites Investigation, Fan Area Human Health Risk Assessment, Britannia Mine Site, BC*, dated July 31, 2002.

URS Corporation. 2002d. Memo to Golder Associates and BCMWLAP re: Interim Remedial Actions, Britannia Fan Area, dated October 31, 2002.

URS Corporation. 2002e. *Britannia Contaminated Sites Investigation, Fan Area Remediation Planning Document*, dated November 6, 2002.



LEGEND

- Study Area
- Existing Buildings
- Roads
- Sediment Ponds

REFERENCES

1) "Fan Area Remediation Planning Document, Britannia Mine Site, B.C." (URS, October 2002).

URS

PROJECT: MWLAP REMEDIATION BRITANNIA

TITLE: **SITE MAP**

Golder Associates

PROJECT No.		012-1830	FILE No.		P1830-02
DESIGN	RP	24MAR03	SCALE	AS SHOWN	REV -
CADD	GG	24MAR03			
CHECK	RP	24MAR03			
REVIEW					

FIGURE 1

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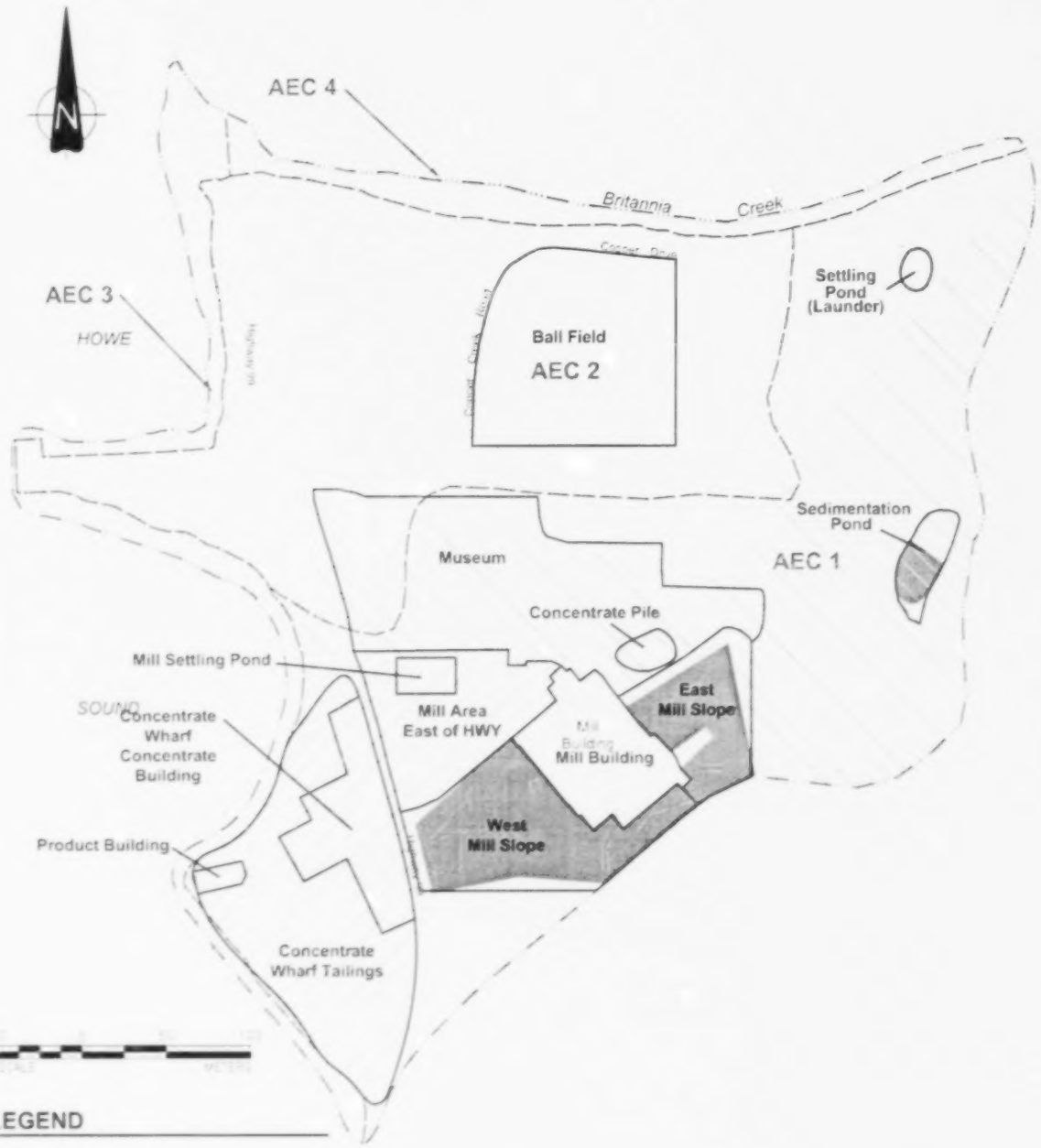


LEGEND

- Study Area
- AEC Boundary
- Waste Rock/Low Grade Ore
- Mixed (Waste Rock/Fill)
- Concentrates/Sludges
- Tailings

REFERENCES

1) "Britannia Contaminated Sites Investigation – Fan Area DSI, Britannia Mine Site, B.C." (URS, June 2002)
2) "Britannia Mine Fan Area Remediation Planning Document, Britannia Mine Site, B.C." (URS, October 2002).

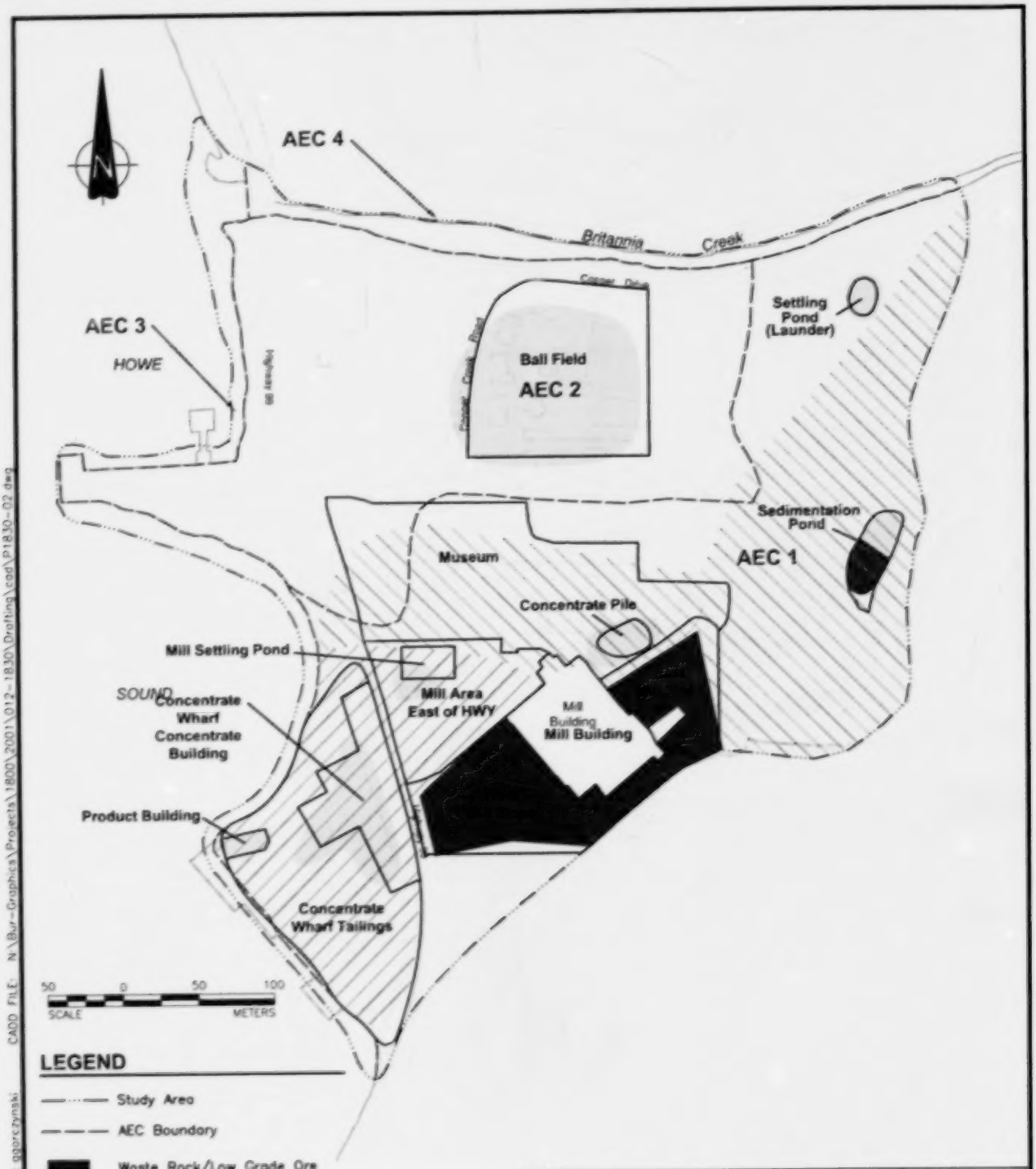
URS

MWLAP
REMEDIATION
BRITANNIA

DISTRIBUTION OF MINE WASTE TYPES

Golder Associates

FIGURE 2



REFERENCES

1) "Britannia Contaminated Sites Investigation – Fan Area DSI, Britannia Mine Site, B.C." (URS; June 2002).
2) "Britannia Mine Fan Area Remediation Planning Document, Britannia Mine Site, B.C." (URS; October 2002).

URS

PROJECT: MWLAP REMEDIATION BRITANNIA

TITLE: DISTRIBUTION OF MINE WASTE TYPES

Golder Associates

PROJECT No.	012-1830	FILE No.	P1830-03
DESIGN	RP	24MAR03	SCALE AS SHOWN REV -
CADD	GG	24MAR03	
CHECK	RP	24MAR03	
REVIEW			

FIGURE 2

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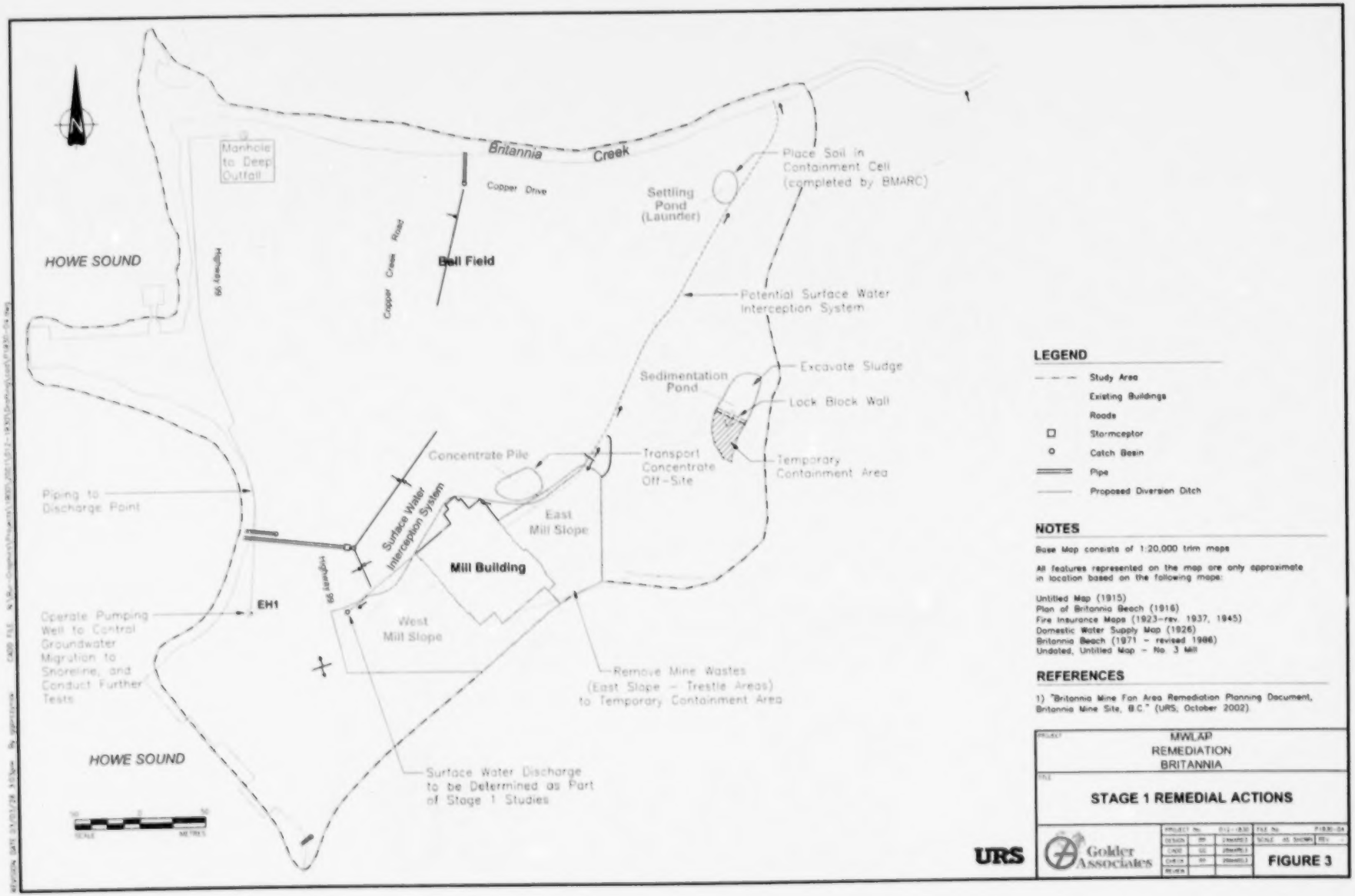

Britannia Creek
Manhole to Deep Outfall
Copper Drive
Settling Pond (Launder)
Place Soil in Containment Cell (completed by BMARC)
HOWE SOUND
Highway 99
Copper Creek Road
Ball Field
Potential Surface Water Interception System
Sedimentation Pond
Excavate Sludge
Lock Block Wall
Concentrate Pile
Transport Concentrate Off-Site
Temporary Containment Area
Piping to Discharge Point
Surface Water Interception System
East Mill Slope
Mill Building
EH1
Operate Pumping Well to Control Groundwater Migration to Shoreline, and Conduct Further Tests
West Mill Slope
Remove Mine Wastes (East Slope - Trestle Areas) to Temporary Containment Area
HOWE SOUND
Surface Water Discharge to be Determined as Part of Stage 1 Studies
LEGEND
Study Area
Existing Buildings
Roads
Stormceptor
Catch Basin
Pipe
Proposed Diversion Ditch
NOTES
Base Map consists of 1:20,000 trim maps
All features represented on the map are only approximate in location based on the following maps:
Untitled Map (1915)
Plan of Britannia Beach (1918)
Fire Insurance Maps (1923-rev. 1937, 1945)
Domestic Water Supply Map (1926)
Britannia Beach (1971 - revised 1986)
Undated, Untitled Map - No. 3 Mill
REFERENCES
1) "Britannia Mine Fan Area Remediation Planning Document, Britannia Mine Site, B.C." (URS, October 2002)
PROJECT
MWLAP
REMEDIATION
BRITANNIA
TITLE
STAGE 1 REMEDIAL ACTIONS
URS
Golder Associates
FIGURE 3

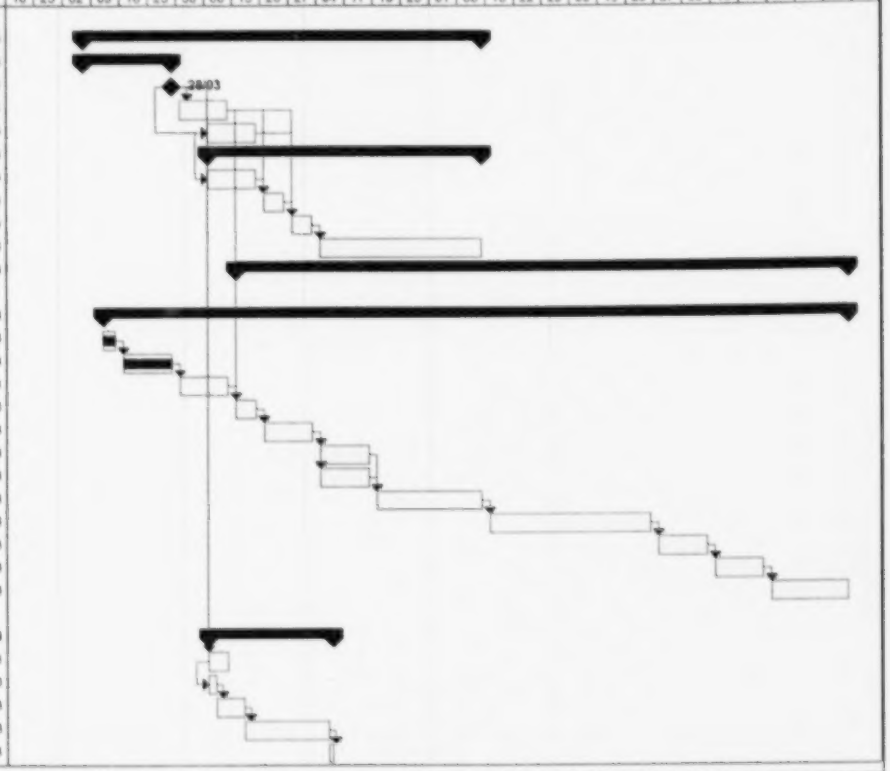
PROJECT NO. 012-1830 DRAWN BY GG REVIEWED BY RP DATE 28MAR03 LOCATION N:\Bur Graphics\Projects\1800\2001\012-1830\Drafting\core\schedule1.cdr

Fri 28/03/03

STAGE 1 REMEDIAL ACTIONS
BRITANNIA MINE REMEDIATION PROJECT

012-1830

ID		Task Name	Duration	Start	Finish
1					
2		**Stage 1 Remedial Actions**	**71 days**	**Fri 07/03/03**	**Fri 13/06/03**
3	✔	**Prepare Stage 1 Action Plan**	**16 days**	**Fri 07/03/03**	**Fri 28/03/03**
8		Submit Stage 1 Plan to Regulator	0 days	Fri 28/03/03	Fri 28/03/03
9		Obtain Regulatory Approval	10 days	Mon 31/03/03	Fri 11/04/03
10		Obtain M. O. U. with Land Owners	10 days	Mon 07/04/03	Fri 18/04/03
11		**Soil Removal Actions**	**50 days**	**Mon 07/04/03**	**Fri 13/06/03**
12		Retain Contractor (Sole Source)	10 days	Mon 07/04/03	Fri 18/04/03
13		Remediate Settling Pond	5 days	Mon 21/04/03	Fri 25/04/03
14		Relocate Concentrate Pile	5 days	Mon 28/04/03	Fri 02/05/03
15		Relocate Mill Area Waste Rock	30 days	Mon 05/05/03	Fri 13/06/03
16		**Permanent Soil Containment**	**110 days**	**Mon 14/04/03**	**Fri 12/09/03**
24					
25		**GROUNDWATER PUMPING PROGRAM**	**133 days**	**Wed 12/03/03**	**Fri 12/09/03**
26	✔	Authorize GW pumping test planning	3 days	Wed 12/03/03	Fri 14/03/03
27	✔	Initial Planning	10 days	Mon 17/03/03	Fri 28/03/03
28		Approval of Plan and Budget	10 days	Mon 31/03/03	Fri 11/04/03
29		Prepare discharge application	5 days	Mon 14/04/03	Fri 18/04/03
30		Approve discharge application	10 days	Mon 21/04/03	Fri 02/05/03
31		Geophysical investigations	10 days	Mon 05/05/03	Fri 16/05/03
32		Mobilize pump and install pipe	10 days	Mon 05/05/03	Fri 16/05/03
33		Inital test period	20 days	Mon 19/05/03	Fri 13/06/03
34		GW modeling and analysis	30 days	Mon 16/06/03	Fri 25/07/03
35		Issue Interim report	10 days	Mon 28/07/03	Fri 08/08/03
36		Develop long-term action plan	10 days	Mon 11/08/03	Fri 22/08/03
37		Regulatory review/approval of long-term plan	15 days	Mon 25/08/03	Fri 12/09/03
38					
39		**SURFACE WATER INTERCEPTOR SYSTEM**	**23 days**	**Mon 07/04/03**	**Wed 07/05/03**
40		Topo Survey of Ditch Alignment	5 days	Mon 07/04/03	Fri 11/04/03
41		Define discharge point	2 days	Mon 07/04/03	Tue 08/04/03
42		Engineeering Design	5 days	Wed 09/04/03	Tue 15/04/03
43		Interceptor Construction	15 days	Wed 16/04/03	Tue 06/05/03
44		Target Completion Date	1 day	Wed 07/05/03	Wed 07/05/03



Project: IRAP SCHEDULE
Date: Fri 28/03/03

Task | Split | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Split | Rolled Up Milestone | Rolled Up Progress | External Tasks | Project Summary | External Milestone | Deadline

Golder Associates

Page 1

PROJECT
MWLAP
REMEDIATION
BRITANNIA

TITLE
SCHEDULE

Golder Associates

PROJECT No.	012-1830	FILE No.	schedule1		
DESIGN	RP	28MAR03	SCALE	NTS	REV.
CADD	GG	28MAR03			
CHECK	RP	28MAR03			
REVIEW					

FIGURE 4

APPENDIX I

LETTER ISSUED TO MINISTRY OF WATER, LAND AND AIR PROTECTION

RE: BRITANNIA MINE REMEDIATION PROJECT - INTERIM WATER TREATMENT, (DATED JANUARY 10, 2002)

ATTACHMENT:

CH2M Mill Memorandum, Dated December 14, 2001

APPENDIX II

URS MEMO

RE: INTERIM REMEDIAL ACTIONS, BRITANNIA FAN AREA (DATED OCTOBER 31, 2002)

APPENDIX III

SOIL MANAGEMENT PLAN

APPENDIX III. SOIL MANAGEMENT PLAN

INTRODUCTION

The following is a generic Soil Management Plan (SMP) that provides guidelines for future remediation activities at the Britannia Mine site. Site specific SMPs will be developed for individual remediation projects at the site, which will be based on the procedures outline below.

The SMP addresses the excavation work to be conducted during remediation activities, and includes guidelines for maintaining health and safety, performing soil excavation and monitoring, field screening and segregation of excavated soil, and sampling and testing of soil. The SMP should be implemented by a qualified environmental professional. Prior to site remediation or development, the roles and responsibilities of the environmental professional, owner, and contractor as they relate to environmental issues should be clearly defined.

Roles and Responsibilities

The following designations are used in this document to refer to the key personnel responsible for executing various work functions and decisions during the remediation process in accordance with Contract Documents to be executed between the Remediator and a Site Contractor. The Contractor selected for the job should have experience in the excavation and management of soils that exceed industrial levels of the B.C. "Contaminated Sites Regulation" (CSR). The Remediator would be assisted in the administration of the excavation Contract by a Consultant. The general responsibilities of these personnel are outlined below. More specific responsibilities are further defined throughout this document.

- Remediator: The Province of BC, represented by the Ministry of Water, Land and Air Protection, will have overall responsibility for remediation activities while liaising with the property owner(s).

- Consultant: The Consultant will act as the on-site Remediator's representative and will have responsibility for field administration of the excavation Contract as it relates to soil and groundwater management. Specific duties will include:
  - monitoring the excavation and transportation of contaminated soil;
  - providing technical input to the Contractor on matters related to soil and groundwater contamination;
  - developing and monitoring the adequacy of the sampling and analysis plans;

- field monitoring of the excavation program to delineate potentially contaminated materials for testing;
- collecting soil and water samples for chemical testing where contaminants are suspected;
- interpreting analytical results; and
- making recommendations regarding the disposition of contaminated soil and groundwater based on the analytical results.

- Contractor: The Contractor will be responsible for excavating, transporting and appropriately disposing the soil in accordance with the terms of the excavation Contract Document and as directed by the Remediator, with technical input from the Consultant.

SOIL MANAGEMENT PROCEDURES

General

The term "soil" is used in this document as a generic term to describe all materials that are present at the Site, including native soils, mine wastes and other fill materials.

Soils Management Procedures During Excavation

Excavation and remediation of the Britannia mine site is expected to proceed in stages. Following each stage, confirmatory sampling will be conducted based on site specific procedures developed in accordance with the guidelines set out by BC Ministry of Water, Land and Air Protection (MWLAP).

Suspect Waste Material

Mine waste will be segregated during the excavation with technical input from the Consultant using the results of previous investigations, information regarding historical land uses, and visual observation.

Special Waste material, if encountered, will be segregated and stockpiled in containment cells constructed in accordance with the requirements of the B.C. Special Waste Regulations. Confirmatory sampling will be conducted to determine its designation. Upon confirmation of classification as Special Waste, within 30 days, all Special Waste material will be stored in an approved temporary storage facility.

Waste materials will be placed in an on-site temporary storage facility.

Stockpile Management Procedures

Some of the segregated fill materials and the Special Waste will be excavated and temporarily stockpiled by the Contractor. Stockpile areas will be determined jointly by the Contractor, Consultant and Remediator and owner so as not to interfere with any concurrent excavation or site operations.

Stockpiles of soil excavated from the Britannia Mine site may be temporarily stored on-site for sampling, prior to being hauled to the temporary storage facility. Management of the stockpiles while on the site will be overseen by the Contractor and monitored by the Consultant. Designated stockpile areas will be assessed prior to the start of excavation to pre-plan the management of stockpile locations, drainage control, and procedures for soil removal. Soils are to be placed far enough away from public walkways and the property boundaries to prevent silt and/or contaminated surface water runoff. These items will be addressed in the site layout planning.

While conducting remedial activities, remediation workers and/or construction workers should wear protective equipment or implement measures to reduce dust generation (for example, by watering or employing other dust suppressants).

Stockpiled soil, when contacted with precipitation, can potentially generate water runoff containing sediments. Under some conditions, contaminants from the soil may also be present in the runoff. Three types of control measures will be used, as required, to reduce surface runoff of contaminated water:

1. tarping of contaminated soil to decrease leaching of the soils;
2. surface water diversion around the base of stockpiles; and
3. silt control measures on the storm runoff water.

1. Tarping Procedures

- Stockpiles of Waste material or Special Waste may be tarped until they are hauled off-site, to reduce the potential for leaching sediment or metals onto other site areas or watercourses.

2. Surface Water Diversions

- Soil berms can be constructed along with surface water interception trenches on the upside of stockpiles to direct water away from the stockpiles. Settling ponds may also be constructed upgradient of sewer drains if suspended solid levels are above

sewer runoff requirements, or if the volume of runoff increases, to enable more settlement time.

3. Silt Control Measures

- As soils are excavated, site conditions will be monitored to ensure that precautions are taken to reduce silt (high suspended solids) or contaminated runoff from the site. Perimeter drainage ditches with silt dams and absorbent booms will be constructed and set in place as required to control rain runoff conditions on site.

Emergency Response Planning

An emergency response plan will be prepared and regularly updated and available at many locations on-site. The following is a list of personnel and equipment to be available on site to respond to typical emergencies:

- Emergency Response phone number list:
  - To be determined. Includes contact numbers for the Fire Department, Hospital, Police, Ambulance, Public and Private Utilities, the Contractor, Consultant, Owner and site security;
- first aid kit;
- spill response kit;
- plastic tarps;
- absorbent pads and booms;
- boot wash and brush; and
- proper PPE (*i.e.,* tyvek suits, nitrile gloves).

All stockpiled soils will be labelled in the field and on a location figure for proper management and data tracking.

In the event that unforeseen site conditions arise, such as extremely heavy rains, the Consultant and the Contractor will conduct regular monitoring of the stockpile area. The Consultant will be informed of any unusual circumstances so that any necessary changes to the site management may be carried out in a timely manner. Careful preparation of site layouts will enable a more efficient control of all the above items.

Sampling of Stockpiled Soil

If required, soil stockpile sampling will be conducted based on the guidelines outlined below:

- Divide the stockpile in five cells of approximately equal volume;
- Collect discrete samples of equal volume from each cell, comprising 3 to 5 subsamples;
- The five discrete samples will be mixed (composited) and the composite samples will be analyzed for the parameters of potential concern. The concentration of each parameter in the composited sample will be considered representative of the mean concentration of the stockpile volume; and
- Replicate composite samples will be collected from every tenth suspect fill stockpile formed over the course of the excavation. This procedure will be performed to verify the adequacy of the compositing technique (*i.e.*, to evaluate the repeat-measurement variability of the compositing method).

Confirmatory Sampling

In-situ sampling of the soil at the base and side walls of the excavation will be conducted to determine site conditions after removal known waste material. The In-situ soil sampling would be conducted based the guidelines described below:

- From any excavation surface, one discrete confirmatory sample should be collected such that there is at least one sample within a grid based on 20 metre increments. More closely spaced confirmation sampling may be necessary where thin identifiable layers are suspected;

- For commercial or industrial quality material, up to four discrete samples collected within one orientation (*i.e.*, vertical wall or horizontal surface) may be composited;

- Combine equal portions of discrete samples collected from within the grid cell, to form a composite sample;

- Analyze the composite sample and a randomly selected discrete sample for the parameters of concern; and

- Replicate samples will be collected from at least every tenth grid cell.

Analytical Testing

If determined to be required, material sampled either in-situ or in stockpiles will be analyzed for metals (the principal contaminants of concern). Analyses for secondary contaminants of potential concern will be selected on the basis of:

- historical land use on and adjacent to that specific area of the site;
- observations made during site excavation; and
- levels of contamination determined in previous site investigations.

For example, in the unlikely event that an underground storage tank is encountered, the contents would be sampled and analyzed for components of gasoline, diesel, waste oil or other relevant parameters; the surrounding soils would then be designated as suspect fill material, segregated and tested for the constituents of concern.

Soil Transport

It is the responsibility of the Contractor to provide a wheel-wash station for trucks leaving the excavation area and to design and implement a traffic control plan.

Tracking and Record Keeping

A system for tracking the origins, volumes, characteristics and ultimate disposition of materials excavated from the site will be implemented by the Consultant and the Contractor.

Information to be recorded includes:

- Location
- Date of Excavation
- Stockpile number (if applicable)
- Destination

Occupational Health and Safety

The standard occupational health and safety procedures prescribed by the Workers Compensation Board Industrial Health and Safety Regulations and additional measures specific to this site (e.g., Mines Act) shall apply to personnel involved in remedial actions at the Britannia Mine site. The additional measures specific to the Consultant and the Contractor will be identified in a Site Specific Health and Safety Plan to be prepared by the Contractor. The Contractor and Consultant field personnel will familiarize

themselves with the health and safety measures required in the Health and Safety Plan and with any other Health and Safety Plans of Contractors and Owners.

Prior to initiation of remediation activities, this SMP should be reviewed and, as warranted, revisions should be made and additional details added to this Plan.

APPENDIX IV

BMARC LETTER TO MWLAP AND MEM

RE: BRITANNIA MINE RECLAMATION PROGRESS REPORT (DATED JANUARY 2, 2003)

APPENDIX V

GOLDER TECHNICAL MEMORANDUM

RE: INVESTIGATIONS NECESSARY TO ASSESS PUMP AND TREAT OPTIONS - BRITANNIA (DATED MARCH 18, 2003)